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Unit Costs, Cost-Effectiveness, and Financing of Nutrition Interventions

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Relative unit costs and cost-effectiveness for different nutrition interventions are reported here. The main impact of nutrition interventions assessed is not the reduction of mortality but the improvement in quality of life for survivors.

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This paper — a product of the Population, Health, and Nutrition Division, Population and Human Resources Department — is part of a larger effort in the department to quantify the costs of malnutrition and its alleviation. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Otilia Nadora, room S6-065, extension 31091 (August 1992, 66 pages).

Horton summarizes what is known about unit costs, the cost structure, cost-effectiveness, and financing of eight nutrition interventions: maternal and child health (MCH) feeding, school feeding, nutrition education, the promotion of breastfeeding, targeted food subsidies, micronutrient supplementation, micronutrient fortification, and growth monitoring. Among items that she reports:

- Mass media nutrition education campaigns and the promotion of breastfeeding cost about $1-$5 per beneficiary; face-to-face nutrition programs cost more ($23 per beneficiary in the Dominican Republic).

- Food distribution programs of different types have fairly similar costs. For distributing about 1,000 calories a day per beneficiary per year: $75 for untargeted food rations, $64 for targeted food rations, $74 for MCH and school feeding programs, and $134 for highly targeted feeding programs. Micronutrient interventions cost from $0.04 to $4 per person-year of protection; supplementation is more expensive than fortification.

- Medium-sized feeding programs (100,000 to 500,000 beneficiaries) are the least expensive. There is little difference in cost between programs operated by nongovernment organizations and those operated by governments. The more expensive programs are not necessarily less cost-effective, but may include more complementary inputs.

- The cost per death averted was about $1,500 for both a targeted supplementary feeding program in Tamil Nadu and a vitamin A capsule distribution scheme in Bangladesh.

- The cost per child removed from moderate and severe malnutrition ranged from $33 (Tamil Nadu) to $331 (targeted food subsidy, Philippines) to $493 (face-to-face nutrition program, Dominican Republic).

- Nutrition expenditures seem to account for about 10 percent of health spending, both for donors and for individual countries (Chile is an outlier with 35 percent).

Impact data on these topics are scarce, and these estimates should be interpreted cautiously.

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ADRA	
CARE	
CRS	Catholic Relief Services
CIDA	Canadian International Development Agency
FHI	Food for the Hungry International
FFW	Food for Work
FNSU	Food Security and Nutrition Unit (Malawi)
ICDS	Intensive Child Development Services (India)
JUNJI	National Association of Kindergartens (Chile)
MCH	Maternal and child health
NGO	Non-government organization
NIPP	Nutrition Intervention Pilot Project (Indonesia)
PAE	School Lunch Program (Chile)
PCA	Complementary Food Program (Brazil)
PSA	Food Supplement Program (Brazil)
PINS	Integrated Nutrition and Health Program (Brazil)
PLF	Pregnant and lactating females
PNAC	National Supplementary Feeding Program (Chile)
PNS	Nutrition through the Health System Program (Brazil)
SNP	Special Nutrition Program (India)
USAID	United States Agency for International Development
WFP	World Food Program

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Executive summary.

This paper summarizes what is known about unit costs, cost structure, cost-effectiveness and financing of nutrition interventions. Eight different interventions are covered (maternal and child feeding - MCH, school feeding, nutrition education, breastfeeding promotion, targeted food subsidies, micronutrient supplementation, micronutrient fortification and growth monitoring).

The following data were obtained on unit costs: mass media nutrition education campaigns cost about $1-5 per beneficiary, with a similar range for (hypothetical) data for breastfeeding promotion. Face-to-face nutrition programs are more costly ($23 per beneficiary in the Dominican Republic). (Data for education programs are current dollars, different years). Food distribution programs of different types have fairly similar costs, since food typically forms the major component of costs. Estimates here suggest that the cost of distributing 1000 calories per day per beneficiary per year is as follows: $75 for untargeted food rations (1 program), $64 for targeted food rations (median, 4 programs), $74 for MCH and school feeding programs (median, 52 programs), and $134 for highly targeted feeding programs (1 program) (all costs in 1988 US $). Micronutrient intervention costs range from $0.04 to $4 per person-year of protection, with supplementation being more expensive than fortification (current dollars, 14 programs).

Some crosstabulations were undertaken of data for 52 feeding programs, to examine the effects of program design on costs. Program costs do not differ consistently by region (sub-Saharan Africa, North Africa, Latin America and Asia), with the possible exception that programs in South Asia cost $10 per year less. There is no consistent difference between costs of school feeding and MCH programs. Program scale does affect costs: medium sized programs (100,000 - 500,000 beneficiaries) are the least expensive. Finally, there is little difference in cost between costs operated by NGO's and those operated by governments, although those with external finance might have higher costs. All these results have to be interpreted cautiously since there may be consistent biases in data quality. Also the more expensive programs are not necessarily less cost-effective, but may

include more complementary inputs. It is necessary to examine impact data in conjunction with costs.

The study also examines cost structure, in particular the share of food and non-food costs in program costs. The differences across program types are not very large. Non-food costs account for about 17% of the total for targeted food rations (median, 4 programs), 25% for feeding programs (median, 81 programs, although the share can be as high as 71% in highly targeted feeding programs such as that in Tamil Nadu), 20-34% in food for work programs (2 programs) and 29% for 1 micronutrient supplementation program.

Again, cross-tabs were undertaken to find the effect of program design, using data for 81 feeding programs. In sub-Saharan African non-food costs are a lower share than food costs; medium size programs have the lowest non-food share if programs are divided into three size groups; and NGO-operated (non-government organization) programs have lower mean non-food shares than those operated by governments. Lower non-food shares may imply more administrative efficiency, but they may also imply fewer complementary inputs.

Cost-effectiveness methods are useful when trying to compare across programs of different types. Although the methodology is widely used in the health area, it is less frequently used for nutrition interventions. The study here summarizes available data on cost per death-averted, cost per child removed from moderate or severe malnutrition, cost per case of blindness prevented, and cost per discounted healthy life year gained. Although cost per death averted is the measure most commonly used in health studies, it is not a very useful measure for nutrition interventions. The main impact of nutrition interventions is not the reduction of mortality, but the improvement in quality of life for survivors. However data to calculate cost per discounted healthy life year gained are almost never available for individual nutrition intervention programs.

The cost per death averted was around $1500 both for a targeted supplementary feeding program in Tamil Nadu and a vitamin A capsule distribution scheme in Bangladesh. The cost per child removed from moderate and severe malnutrition ranged from $33 (Tamil Nadu), $331 (targeted

food subsidy, Philippines), to $493 (face-to-face nutrition education, Dominican Republic). The same cost for a mass-media nutrition education scheme ranged from $5-12 (costs in current prices). Costs per death averted would therefore generally be well above the $1500 figure, except for mass media projects (and the impact data on the latter are not very good). Data from the Narangwal study suggests that nutrition interventions are most cost-effective for prenatal supplementation ($187 per death averted, 1988 prices), and become progressively more costly as children get older.

Financing data are also scanty. Nutrition expenditures seem to account for about 10% of health expenditures, both for donors and for individual countries (Chile is an outlier with 35%). For the 5 countries for which data were available, the share of nutrition expenditures in GDP ranged from 0.06 to 0.41% (three of the five were in the range 0.16-0.18%). About 90% of expenditures were financed by the central government, and 10% by local government. The poorer the country, the larger the share of central government financing from foreign sources.

More work is needed to improve data on costs, impacts and financing. One priority area for future work includes better cost breakdowns for all programs (the food/non-food distinction is not very helpful: programs with high non-food costs for reasons of inefficiency cannot be distinguished from those with high non-food costs due to complementary service provision). One particular omission in the data is that there appear to be no data for the food/non-food cost breakdown for untargeted food subsidies. Another priority would be to obtain project cost data for nutrition education interventions and breastfeeding promotion (there are currently no data reported from any breastfeeding promortion projects): these data could be obtained for existing projects with limited work. More analysis of feeding programs could be undertaken using existing standardized project reports (USAID PVO Child Survival data, USAID Outreach data, WFP project proposals), to increase information about effects of project design. Another fruitful avenue for exploring the effect of project scale on costs would be to analyze existing feeding program data at the lowest service delivery unit level (e.g. anghanwadi level data for the Intensive Child Development Services

program - ICDS - for India).

Impact data are in general weak and available mainly for (possibly unrepresentative) research studies. Hence data on cost-effectiveness are particularly deficient. This is also a priority area, since otherwise there is a possibility of misallocating health resources towards other types of interventions for which cost-effectiveness data are more readiiy available and more persuasive. Information on financing are also very limited. Data on all aspects tend to be (unsurprisingly) least good for Africa.

Increased pressure on government budgets in recent years has led to greater interest in issues of cost and effectiveness of government expenditure, and this has been true in the social sectors as in other areas. There has been a relatively large amount of work already done on the cost and effectiveness of education, health and social security expenditures, but relatively less attention has been paid to government expenditures on nutrition programs as distinct from health. This paper tries to summarize what is known in the existing literature on unit costs, cost structure, cost-effectiveness and financing of nutrition programs. The paper tries to cover 8 different types of nutrition interventions (MCH feeding programs, school feeding programs, nutrition education, breastfeeding promotion, targeted food subsidies, micronutrient supplementation, micronutrient fortification and growth monitoring). Insufficient information was obtained to assess several other interventions (comprehensive early childhood interventions, home gardens and food safety and quality control).

Since a large number of interventions are covered, the paper relies on existing surveys of the costs of individual types of interventions. However in view of the paucity of available literature, there is some new analysis of project level data, either obtained from existing compilations, or directly from project documents (in particular World Food Program - WFP - project proposals). Suggestions are also made as to where further cost data might be obtained, particularly for those types of interventions where existing studies are most scarce. As regards financing, there are equally very few studies. Previous studies containing data on government expenditure on nutrition interventions were found only for Brazil and India (in general, expenditures on nutrition are not presented separately from those on health). The present study therefore presents results from three country case studies, on Chile, Philippines and Malawi, to give some idea of the range of financing levels and sources in three countries of different levels of per capita income.

Section I of the paper discusses some of the methodological issues on costs, section II presents unit cost figures, section III deals with cost structure (in particular the share of food costs in total

costs of an intervention), section IV covers cost-effectiveness, section V financing, and section VI summarizes. The bulk of the results are presented in tables, with a brief text discussion. There is much that can (and has been) said about cost and effectiveness of interventions without recourse to actual cost data. Rather than repeat the conclusions of other studies, this paper tries to amass as large a database as available, in order to draw some new conclusions.

I. Methodology.

This section discusses some of the methodological problems, both with respect to defining cost-effectiveness, and with obtaining data on costs and impact of nutrition interventions. Cost-effectiveness methodology is widely used in the health area (as a more readily quantified alternative to cost-benefit), and it therefore seems natural to extend this to nutrition interventions. Cost-effectiveness studies have been very widely undertaken for child survival initiatives in developing countries, for instance. Stewart (1988) for example surveys the cost-effectiveness of four types of child survival interventions, and Brenzel (1989) surveys 28 immunization projects in 16 developing countries. However there is a paucity of such studies in the nutrition area.

There are very few attempts to undertake cost-benefit analysis of nutrition interventions (Scandizzo and Swamy, 1982, for the food distribution system in India, and for micronutrients Levin, 1985, Correa, 1980 and Popkin et al, 1980). Cost-benefit studies will not be discussed here.

It is interesting to speculate as to why so few cost-effectiveness studies exist for nutrition interventions. One reason is perhaps that less is spent on nutrition interventions than on some health interventions (nutrition expenditures form about 10% of health expenditures in developing countries). More importantly, it is much more difficult to assess the impact of nutrition interventions which occur over a reasonably long period of time, with equally long-lasting results, as compared to the impact of an immunization program with a very well defined, short duration "input", and an easily measured

outcome. It is no accident that the greatest number of cost-effectiveness and cost-benefit studies for nutrition interventions are for micronutrient projects, which have inputs and outcomes which are easier to measure and define.

More importantly, the most commonly used measure in health (cost per death-averted) is not very appropriate for nutrition interventions. It is rather an extreme outcome measure to use for nutrition interventions. Nutritional improvements have many effects other than lower mortality, such as decreased morbidity and hence decreased use of health care facilities, improved learning and ability, higher productivity and hence earnings, increased activity levels, etc. The effects on cases of severe malnutrition (both PEM and micronutrient deficiency) and hence on decreasing the probability of death, is therefore only the "tip of the iceberg". Huffman and Steel (1990) discuss what they call the "dark side of child survival", arguing that narrowly focussed health initiatives may decrease mortality but do little for the quality of life for survivors, whereas nutrition interventions have generalized effects on both morbidity and mortality. Thus an alternative cost-effectiveness measure which combines mortality and morbidity information into a measure of "healthy days saved" is probably preferable, but data requirements mean that such a measure has been only rarely used.

Using cost per death averted may make nutrition interventions compare unfavourably with health interventions. The simplest health interventions (immunization, ORT) have cost-effectiveness figures as low as $50-$100 (Stewart, 1988), whereas the lowest such figure for an actual feeding program is around $1500 (for Tamil Nadu's highly selective feeding program, in a region with very high prevalence of moderate and severe malnutrition, discussed in Ho, 1985). Estimates for prenatal maternal supplementary feeding are lower ($187 per death averted converted to 1988 dollars, for Narangwal, India). Many other health initiatives (e.g. water and sanitation projects, vaccines against cholera and rotavirus) have cost-effectiveness figures also around $1500 (Stewart, 1988). Nevertheless, it is clear that on a cost per death averted basis, interventions involving feeding do not

compare very favourably to health interventions (except for prenatal supplementation). However, arguably this is a problem of the measure being used, not that nutrition interventions are intrinsically more costly.

Other cost-effectiveness measures have been used, for example the cost of a given improvement in height (Burger et al, 1990), the cost per '000 calories delivered (Pinstrup-Andersen, 1988, although arguably this is more an output than an outcome measure), and value of a food transfer to the recipient compared to its cost to the donor (Katona-Apte, 1986, Reutlinger and Katona-Apte, 1983: this is the measure of cost-effectiveness used by the WFP). Information on calories transferred can usefully be modified using information on leakage (i.e. proportion of target group amongst beneficiaries) to calculate cost per '000 calories per beneficiary in target group. Anderson (1979) for example presents information on the cost per calorie delivered to a child with a calorie deficit, and the cost per calorie delivered to a (severely) malnourished child. This type of calculation may be useful (in the absence of outcome data), for comparing programs of the same intervention type. For example there may be lower unit costs of nutrition interventions in countries in Latin America with good infrastructure but relatively lower rates of malnutrition, and higher unit costs in countries in Africa with weak infrastructure but possibly higher rates of malnutrition. Similarly unit cost data could be used to compare interventions which are untargeted, with similar targeted interventions: the former may have lower costs per beneficiary, but on a cost-per-target-beneficiary basis the latter programs may be more cost-effective. In practice however, it is not easy to obtain comparative data on cost per target beneficiary, since the definition of the target group tends to vary across countries and across studies. However none of the alternative cost-effectiveness measures discussed in this paragraph allow comparison across different project types, and are therefore of more limited usefulness.

The above paragraphs have discussed some of the theoretical problems involved when

applying cost-effectiveness to nutrition interventions. There are of course the usual practical problems even with estimating costs. Most nutrition interventions are joint with other interventions: MCH feeding and growth monitoring occur in conjunction with health services, food stamp or food subsidy targeting frequently uses the health or social welfare system, and school feeding programs use the facilities of the education system. Often the overhead costs of these other vehicles are not taken into account, such that the costs of nutrition interventions are underestimated. At the same time, if these other services are not available (as in many cases in Africa), nutrition interventions can appear prohibitively expensive, if the full cost of setting up the delivery system is assigned to the nutrition project alone. Similarly there are biases in the costs reported of those projects where aid donors (such as USAID or WFP) require (or encourage) local co-financing. Developing country governments are encouraged to assign local expenses to the nutrition intervention in order to report a desirable level of local input. If the full cost of health worker salaries are included in the cost of a MCH feeding project via health centres, this is likely to overestimate the actual cost of the nutrition intervention. Cost data from NGO's also have problems, in that these organizations often maintain cost data not by program, but by source of funding, and do not fully cost items which are supplied free or at less than market value. There exist therefore very few studies with carefully collected cost data (e.g. Anderson, 1977), other than research projects (which may be highly unrepresentative).

Since unit cost data are difficult to come by, existing studies tend to cite over and over again data from the same few projects. Some types of interventions are covered better than others. Data on unit costs of school feeding programs are relatively common (both MCH and school feeding), although usually not presented in a standardized format allowing comparison across projects, and impact data are scarce. Likewise data on costs of food subsidies exist, although usually not in the form of cost per number of calories per beneficiary, and there are almost no impact studies which can be related to costs (with the sole exception of Garcia and Pinstrup-Andersen, 1987). Cost data are

more readily available on micronutrient interventions, and there are also more cost-effectiveness studies in this area. Data on the other nutrition interventions (nutrition education, breastfeeding promotion, growth monitoring) listed earlier are even more scanty.

The present study is therefore forced to use cost data which are less than ideal, in an effort to learn something about operation of projects other than research ones. There is a fair amount of consistency even with these less-than-ideal data, but there is also a lot of noise in the data. It is also not clear whether it is worth advocating that agencies operating nutrition interventions expend a great amount of effort in collecting cost data. USAID did a field test of a cost information system developed for PL-480 Title II programs operated by NGO's, and came to the conclusion that it was not worth the effort (Bremer and Gilmore, 1986). The authors argued that although the on-site costs of different interventions differed (school feeding, MCH, and food-for-work), this information was not used as an allocative devices for food aid. The same authors concluded that cross-country comparisons were also potentially dangerous. It would be politically extremely difficult to make value judgements about aid allocations, if for example it were shown that programs in Africa were more costly or less cost-effective that those in South Asia. However some of the programs (in particular the WFP and the USAID-funded PVO Child Survival Program) have made more efforts at standardizing cost and beneficiary data, and this lead might be followed especially by the larger NGO's and by the USAID title II food aid program.

Well-controlled impact data are even scarcer than good cost data. Indeed, some nutritionists have argued that one should not expect to see impacts of feeding programs on children's growth, when children are over 3 years old (Beaton, 1990). Haaga et al (1984) and others have discussed the methodology involved in interpreting change in nutritional status in the program setting. One problem with existing data is that the definition of severe malnutrition (in terms of number of standard deviations below the median, or percentiles of the reference population) is not always

consistent between studies (in particular the studies for India sometimes employ different reference standards). In calculating numbers of deaths averted, studies usually assume a particular death rate for severely malnourished children, and hence base effectiveness results on the reduction in numbers of severely malnourished children. There are ethical problems in collecting these data (severely malnourished children, once identified by health personnel, are usually referred for treatment). Thus these data are somewhat imprecise.

Having outlined some of the methodological and data problems, the next three sections go on to discuss in turn unit costs, cost structure, and cost-effectiveness of selected nutrition interventions.

II. Unit costs.

Unit cost data are more readily available than cost-effectiveness data, since it is relatively easier to calculate the number of beneficiaries of a project (or the volume of food delivered), than program impact. However it is not very meaningful to compare unit costs across different programs. For example the cost of a radio message containing nutrition education information may be $1-5 per person, and a feeding program might cost $70-90 per person per year per '000 calories delivered per day, but these cannot meaningfully be compared in this form. Unit cost information is more useful when comparing different interventions of the same type, but even this has to be done with care. Is a $5 radio message simply more costly for the same outcome as a $1 one, or might it be more effective?

For feeding programs one important standardization which can be undertaken is to take account of the size of the ration and the number of feeding days. (Throughout this paper we use cost per beneficiary measures for unit costs of feeding programs, rather than the less preferable cost per unit of food delivered.) Mateus (1989), Beaton and Ghassemi (1979) and Ghassemi (1989) performed an enormous service in compiling unit costs of feeding programs, but stopped short of standardizing

by calories delivered per day. Without standardization it is difficult to compare for example MCH and school feeding programs. The latter tend to have smaller ration sizes which are supplied for fewer days per year. Unit costs of feeding programs are therefore presented here as the cost per '000 calories per person per day per year. (In undertaking the calculation, it is assumed that there are no economies of scale in ration size or in number of days per year fed. I.e. the reported data are simply multiplied by 1000/actual number of calories in ration, and by 365/actual number of days per year fed)

We discuss below some of the practical issues involved in calculating unit costs, before discussing the results, which are presented in tables 1-4 and Appendix table 1. Section I has already mentioned some of the problems involved in calculating costs, such as the difficulties involved with joint costs, and the cost of items not supplied at market prices. Data on the number of beneficiaries are also suspect. Although some feeding programs are very intensive, others are of the "truck and dump" variety. Bremer and Gilmore (1986) describe the NGO's general strategy of managing food distribution with limited resources as follows:

> "1) They concentrate complementary inputs on a few carefully chosen sites where they can implement an integrated program combining food and other inputs.
>
> 2) They devote the remaining resources to comparatively intensive development activities that do not use food aid, while implementing the food distribution programs as efficiently as possible (i.e. as cheaply as possible consistent with sound management and control.)"

In the "truck and dump" types of feeding programs operated by NGO's, information on numbers of beneficiaries tends to be inexact. This may also be true of many government-operated distribution systems. Brazil is one of the countries which has undertaken the most evaluations of its food programs. Checks on numbers of beneficiaries suggested that reported and actual numbers of beneficiaries differed widely (Musgrove, 1989, World Bank documents). Thus the cost per beneficiary data are prone to errors.

The unit cost data presented in the tables here are drawn from compilations by other authors. For the feeding programs the costs were standardized by this author. In addition, the feeding program data were supplemented by costs of 13 WFP feeding programs, calculated by the author from a sample of WFP project documents. The WFP allots between 20 and 30% of its resources for feeding programs for what they term vulnerable groups (MCH and primary school). In 1989 for example such feeding programs accounted for 28% of their commitments (WFP Annual Report, 1990). The 13 projects examined here are those which were reviewed at the 25th and 26th sessions of the WFP donors' review group (costs were calculated for any phase of these projects for which data were on file at CIDA - Canadian International Development Agency, not necessarily the exact phase under review at those sessions). Costs were calculated from project proposal documents, excluding non-recurrent costs. According to the sample of evaluation documents available, most projects have beneficiary numbers quite similar to those projected in the proposals (evaluation data are more scanty and less standardized than proposal data). In those cases in which project size increases unexpectedly, additional budget requests are usually made. Thus the WFP are prospective not actual project data, but projects usually operate pretty much on the planned scale (if not necessarily the planned schedule).

Table 1 presents information on education-type interventions, both nutrition education, and breastfeeding promotion. Mass media nutrition education campaigns are quite inexpensive, ranging from $1-5 per beneficiary. Breastfeeding promotion efforts (including changed legislation on infant formula, education efforts in hospitals for both mothers and hospital staff, and policies encouraging "rooming in") are also estimated to cost $1-5 per mother. Levine and Huffman (1990) present additional data on costs and savings of breastfeeding promotion, although not in the unit cost format used here. Costs of face-to-face nutrition education programs such as that in the Dominican Republic (integrated with growth monitoring) are higher ($23 per beneficiary), and costs of other programs to

encourage breastfeeding (nursing breaks, workplace creches, maternity leave) are over $100 per beneficiary.

Table 2 presents information on the unit costs of targeted food subsidies, adapted from Pinstrup-Andersen (1988). There is a large variation. Costs, standardized as described above, range from $36-172 per beneficiary, with a median of $75 and a mean of $82. The item subsidized obviously affects costs: milk subsidies are expensive on a cost per calorie basis, whilst subsidies on oil seem to be cheaper than those on grains. There exist data on too few programs to make other generalizations.

Table 3 presents summary information on the 52 feeding programs studied, calculated from the data in Appendix table 1. There exists again an enormous range of costs ($19-300, with a median of $74 and a mean of $89, i.e. on average very slightly higher than the costs of targeted food subsidies in table 2).

Cross-tabulations were undertaken to see how program cost varied with location, project size, project type (school feeding as compared to MCH), and the operating agency. This type of analysis has been undertaken only infrequently before, due to lack of data on sufficient numbers of projects. Information was available here on project location for all 52 programs, project type (school feeding versus MCH) for 48 programs (those of mixed type were excluded), project scale for 24 programs, and project operating agency for 51 programs.

Robert R. Nathan Associates (1987) did attempt some earlier analysis of costs of feeding programs, reproduced here as table 5. Their results were extremely tentative since they were based on only 7 programs, possibly an unusual subset of programs (those applying for USAID Outreach grants), and only contained data on the non-food costs. Nathan Associates concluded that the African programs were on average 10 times as expensive as the Latin American ones (in terms of non-food costs only), and that the cost difference might partly be attributed to their much smaller scale (the

African programs had about a tenth as many beneficiaries per program). If one assumes that non-food costs are around 30% of the costs of Latin American feeding programs, then Nathan Associates' data would suggest that African programs would still cost about 3 times as much as Latin American ones, if food costs in Africa and Latin America were about the same. However these data are not standardized by size of ration and number of days fed, and it proved impossible to retrieve the data on ration size and days fed from all the NGO's concerned.

The data here suggest that the Nathan Associates' results are somewhat unrepresentative. The costs of programs in Asia and Latin America are lower than those in North and sub-Saharan Africa (by $10-20 per beneficiary) if the median is used, but programs in South Asia and sub-Saharan Africa are about $10 cheaper per beneficiary than those in North Africa and Latin America if the mean is used. It is possible that there are differences in cost structure, an issue addressed in section III. Costs of ocean transport and food distribution are quite likely higher in Africa due to lower population density and weaker infrastructure, but programs elsewhere may compensate by including more complementary inputs.

As regards the comparison between school feeding and MCH programs, there seems to be little difference. Mateus (1989) had commented that school feeding programs were cheaper on a straight cost per beneficiary per year basis, but this disappears once the smaller ration size and fewer feeding days of the school feeding programs is taken into account. MCH programs could potentially include more complementary non-food inputs than school feeding programs, which could account for the larger range of costs for MCH programs. (One might also suspect that the most costly school feeding programs are somewhat inefficient).

As regards program scale, this is an issue on which there has been very little information. Cost functions have been very standardly calculated for health interventions (e.g. hospitals), but rarely if ever for nutrition interventions. The limited data here suggest that small programs are the most

costly (small implies less than 100,000 beneficiaries), and medium sized ones the least costly (where medium implies 100,000 to less than 500,000 beneficiaries). The most expensive programs tend to be small scale, likely because these intensive feeding programs simply cannot be afforded on a larger scale. These data should be interpreted cautiously since it may be the case that small projects have more complementary inputs, and do not necessarily suffer from diseconomies of scale. The scale issue is one which could fruitfully be examined for homogeneous programs (or using information on delivery unit variation within one program such as the ICDS).

There seems to be little difference in cost by operating agency (government versus NGO), although there may be differences by availability of external funding (the data were not complete enough to allow further investigation of funding source, but this might be an interesting point to investigate in future work).

Table 4 presents information on unit costs of micronutrient interventions (this is table 7.12 from Levin et al, 1990). The costs per person-year of protection are very low, ranging from about 4 cents to about $4. The costs vary somewhat by micronutrient, iron being the most expensive on average, and supplementation in general seems more expensive than fortification.

III. Cost structure.

This section focusses on one aspect of cost structure, namely the share of food and non-food costs in project cost (where food costs include any costs of ocean transport, where applicable). This measure of cost structure is the one most widely mentioned in other studies (Berg, 1987, Beaton and Ghassemi, 1979, Anderson, 1979, Mateus, 1983, Pinstrup-Andersen, 1988, Sahn, 1980, etc.). This criterion cannot however be used for nutrition education, growth monitoring, and breastfeeding promotion programs. Micronutrient interventions can be included if the cost of the micronutrient source is included in place of food costs. Data on the share of food in total costs are presented in

tables 2, 6, and 8 (the results in table 6 are calculated from figures in Appendix tables 1 and 2). Table 2 presents information on food subsidies, table 6 on feeding programs, and table 8 has summary information for a range of programs also including micronutrients and food for work.

There are no clear guidelines as to what a desirable level of non-food costs is: high values may either indicate administrative inefficiencies, or a high level of complementary inputs. The non-food cost share of a targeted food subsidy (particularly a food coupon scheme) is a somewhat nebulous concept. For the Jamaican food stamp project the costs are those of printing the stamps, security, and mailing them out: costs of identification and screening beneficiaries are omitted (these are incurred by other agencies). Thus the non-food cost share would decline if the face value of the stamps were for example doubled. This would however not imply that the program had become more efficient. Thus non-food cost share data have to be interpreted somewhat cautiously.

Table 2 shows that food costs range from 63-88% of program costs for targeted food subsidies (with a mean of 79% and a median of 83%). Non-food costs are a slightly higher fraction for feeding programs (table 6), and range from 11-95% (with a mean of 70% and a median of 75%: note however that data are available for a far greater number of feeding programs than food subsidies). Some of the outliers in the feeding program data likely reflect bad data, where non-food costs are inadequately quantified, or cases where the programs have a large share of complementary inputs.

There exist some interesting variations across feeding programs. Programs in Latin America have larger non-food cost shares, and Africa smaller ones, than for other regions. Bearing in mind that no consistent regional differences in unit costs were found (table 3), one possibility is that the food costs alone in Africa are higher (in particular transportation costs), whereas in Latin America due to better infrastructure there are larger complementary inputs. As regards program scale, the medium-size programs which were earlier found to have lower unit costs, also have lower non-food

cost shares. This may reflect either scale economies, or also the fact that programs with intensive health inputs tend to be smaller. There is little difference in non-food cost share by operating agency. NGO-operated programs (and also WFP-funded ones) have lower mean non-food cost shares than government-operated ones (although the medians are not different.

Table 7 provides some information on non-food costs for programs within one country, namely Brazil. There was some experimentation in program design which yields some interesting information. Firstly, the exclusion or inclusion of health inputs can change the share of food in total costs from 25% to 73% (data from the Nutrition through the Health System - PNS - program). Secondly, the Complementary Food Program (PCA) distributing weaning foods has a lower share of non-food costs than the PNS variant without health inputs, but only because of the much higher unit costs of food (blended foods being more expensive than traditional ones). Finally, the degree of subsidization of foods also affects the share of food in total costs, but at the same time has quite dramatic effects on participation (The Integrated Nutrition and Health Program - PINS - study experimented with different levels of subsidy). Data on the proportion of families continuing to buy subsidized foods after two years were as follows: 74% in the group with the 60% subsidy continued buying, 37% in the group with the 45% subsidy and a growth monitoring requirement, 55% in the group with the 45% subsidy (and no growth monitoring), and 25% in the group with the 30% subsidy. Participation data such ase these are extremely useful as an additional way to assess cost data, but are rarely available.

Table 8 provides a typology of the costs of different programs, both unit costs and non-food cost share in total costs. For comparison, older information on these topics are included from Mateus (1983). The latter document is somewhat of an advocacy piece on targeting food subsidies, and the data in his table appear to be notional, rather than being based on specific project data. Since the Mateus study has been cited (for example by Kennedy and Alderman, 1987, one of the more

influential articles in the area of costs), the present author is concerned to update somewhat the impression conveyed by Mateus' figures. Two of the most striking aspects of Mateus' figures are the extremely high cost per beneficiary of untargeted food subsidies, and the extremely low administrative costs of food coupons. Neither of these could be substantiated with more recent empirical data.

Firstly, regarding unit costs. The more recent data in table 8 show that the median value for unit costs is in fact rather similar for three programs, namely untargeted food rations ($75 per beneficiary, albeit this is derived from only one program), targeted food subsidies ($64) and untargeted MCH and school feeding programs ($74) (Tamil Nadu, as an example of a highly targeted feeding program, was about twice as expensive). Although no data were found on untargeted food subsidies, it is unlikely these would be much different on a per-beneficiary basis. Unit costs of different programs might differ if costs per beneficiary in a specific target group were calculated, but almost none of the unit cost data are available on this basis.

Secondly, as regards non-food costs. These are somewhat lower for the targeted food subsidies (the median is 17%) than for feeding programs (median 25%), and food for work programs (20-34%, based on only two programs). However none of the three programs using income targeting of food subsidies (from which these data were obtained) include any cost of identifying the target group, which may bias the figures down somewhat. Moreover Mateus' (1983) estimate of non-food costs of 2-5% for non-food costs of targeted food subsidies seems unduly low (likely being based on early estimates of the costs of the Colombian food coupon program, which have since been revised upwards).

It is not very surprising that the different programs are so similar in costs. If similar items (i.e. grains or oil) are subsidized, and if non-food costs are fairly low (e.g. a monthly ration pickup at a health centre, a geographically targeted food subsidy using existing outlets, or a school feeding program involving trucking food to schools and paying for a cook), then it is likely that ration,

subsidy and feeding programs will have similar costs. 75% of the costs after all are those of the food. Thus it is unlikely that the differentials are as wide as suggested by Mateus (1983). Programs which provide greater services are definitely more costly on a unit cost basis, although potentially more cost-effective. However data on cost-effectiveness, discussed in the next section, are not as yet adequate to address that issue.

IV. Cost-effectiveness.

ection I has already described the methodological and practical difficulties involved in cost-effectiveness measures for nutrition interventions. Table 9 summarizes the available estimates from program data either on the basis of cost per death averted, case of malnutrition averted and case of blindness prevented. Only 7 projects provided information of this type, of which 1 provided information on cost per death averted, 5 on cost per case of malnutrition averted (child removed from moderate or severe malnutrition), and 1 on cost per case of blindness prevented. The estimate of cost per case of blindness prevented is converted into cost per death averted, using estimates of case-fatality rates. Similarly the cost per case of malnutrition averted could be converted to cost per death averted, using data such as in Ho (1985) or Burger et al (1990). (This is an upper bound since not only might children with moderate or severe malnutrition move into the mild malnutrition class, but some children might also move from mild malnutrition to the normal group, which also reduces the mortality rate).

The data tabulated here are direct estimates from individual projects. Other authors have calculated cost per death averted or cost per discounted healthy life year (DHLY) gained, making assumptions using "typical" project cost data and "typical" outcome data. Burger et al (1990) estimate cost per death averted from preschool food supplementation to be $1,236 ($40 per DHLY), and from prenatal maternal supplementation to be $724 ($24 per DHLY). McGuire (1990) also

provides information on cost per death averted and per DHLY gained for a wide range of nutrition interventions.

The cost per death averted figures in table 9 are $1482 for (highly targeted) supplementary feeding in Tamil Nadu, and $1522 for a vitamin A capsule distribution scheme in Bangladesh. These figures (as discussed in section I) are comparable to some other health interventions, but definitely more costly than EPI and ORT interventions. Tamil Nadu is evidently at the low end of cost per death averted as compared to food subsidies and face-to-face nutrition education: the cost per child removed from moderate or severe malnutrition in Tamil Nadu is $33 compared to $331 for a food subsidy in the Philippines, and $493 for a nutrition education/growth monitoring project in the Dominican Republic. Comparable costs for mass media nutrition education efforts are lower ($12 for Indonesia NIPP and $5 for Morocco), although the outcome data for these projects are not as well controlled as some of the other studies.

Table 10 presents estimates of costs per death averted from the Narangwal project. Data are available for 3 different types of intervention (nutrition, medical care, and combined nutrition and medical care), for three different age groups (perinatal, infants, and children 1-3). The study was unusual in that it included a control group. It was also primarily a research study and not a large-scale service-delivery project. There are some interesting findings. Firstly, cost per death averted increases with age: perinatal deaths are the least expensive to avert, followed by infant deaths, with child deaths being the most costly to avert. The type of intervention which is the least costly varies with age. For perinatal deaths, nutrition interventions (pre-natal maternal supplementation) alone are the cheapest, whereas for infant and child deaths, medical interventions alone are most cost-effective. The high figures for cost per death averted for children 1-3 ($3053 for nutrition interventions alone, $1617 if combined with medical interventions) underscore the discussion in section I earlier.

Another useful source of information to supplement cost-effectiveness calculations, are

estimates of program leakage to non-target beneficiaries. This allows a potential link between cost per beneficiary (as discussed in section II), and cost per child removed from severe malnutrition (as presented in table 9), although additional information or assumptions are required to actually make that linkage. Anderson (1977) finds that to convert cost per beneficiary to cost per malnourished child fed requires multiplying by a factor of between 1.6 and 10.5. (The actual figures, for five different CARE projects, were: Tamil Nadu, 1.6; Pakistan, 1.9; Costa Rica, 3.1; Dominican Republic, 4.9; and 10.5, Colombia). Anderson however does not present information such that it is possible to calculate cost per child removed from malnutrition.

Obviously program data on cost-effectiveness of nutrition interventions are severely deficient.

V. Financing.

As in the area of costs, the financing of nutrition programs has received far less attention than the financing of other social sectors such as education or health. Recent World Bank work on social sector expenditures in Latin America for example does not include disaggregated information on nutrition expenditures. Although some of the nutrition expenditures may be included in health expenditures, those which go through institutions other than the Ministry of Health are likely to be excluded. Detailed information on country expenditures on nutrition could be obtained only for India (Subbarao, 1989) and Brazil (Musgrove, 1989, and unpublished World Bank documents). For India information is available on state and central government expenditures, and for Brazil for federal government expenditures (state level expenditures are estimated to be about 10% of federal ones for Brazil: Saxenian, personal communication). In addition, Mateus (1989) painstakingly compiles information on expenditures on MCH and school feeding programs in 16 Latin American countries. (These data obviously form only part of country expenditure on nutrition interventions, although possibly the lion's share). Finally, Huffman and Steel (1990) reproduce data from two other

sources, on expenditures on health and nutrition by UN agencies in 1987, and on allocations for health and nutrition under child survival by USAID in 1988. Figures are generally available only for expenditures by international agencies and national or local governments (Mateus 1989 is an exception). Figures for private and NGO funding of nutrition interventions (which may be an important component for some countries) are not readily available. To supplement these data, country studies were undertaken for Chile, Malawi and the Philippines (Appendices A, B and C respectively).

The available data are reproduced and summarized here in table 11 (on expenditures by country) and table 12 (expenditures by UN agencies and USAID). Appendix tables 1 and 3 also contain additional information on the percentage of nutrition expenditures financed externally. One finding from tables 11 and 12 is that nutrition interventions account for only about 10% of expenditures on health (9% for Malawi, 10% for the Philippines, 11% for Brazil, 13% for UN agencies, and 15% for USAID child survival). Chile however is unusual in that its nutrition programs account for 35% of health expenditure. Nutrition expenditures as a share of GDP vary widely, from a low of 0.06 in the Philippines, to a high of 0.41 in Chile, with the other three countries in the table clustered at 0.16-0.18.

Mateus' data allow comparison of expenditures on feeding programs in 16 Latin American countries (table 11). Whilst these programs do not account for all expenditures on nutrition interventions, they certainly are an impoartant and expensive component. The countries with large total (i.e. domestic plus foreign) expenditures on feeding programs are not necessarily the poorest. Although expenditures on feeding programs are large in Bolivia and Haiti, they are also large in Brazil, Chile, Jamaica, Mexico and Costa Rica which are better off, and small in (relatively poor) Peru. Poorer countries do tend to attract a higher proportion of external financing (Appendix tables 1 and 3). As regards domestic resources applied to feeding programs, the best performers are Chile,

followed by Brazil, Costa Rica and Mexico. Chile allots almost 0.5% of its GDP to nutrition, whilst the others allot 0.25% or more. Once external resources are added in, Bolivia, Haiti and Jamaica join the ranks of Latin countries with expenditures on feeding programs of over 0.25% of GDP.

Three country studies were undertaken in order to try to supplement the rather meagre available data on financing of nutrition interventions. Data were generally available for these countries to estimate the contribution of central government and external funding, but not usually for that of local government.

For Chile (Appendix A), there are three major nutrition interventions (the National Supplementary Feeding Program, PNAC, for preschoolers, the School Lunch Program, PAE, and the National Association of Kindergartens, JUNJI, a daycare feeding program). Appendix table C1 presents information on expenditures on these programs from 1974 to 1988, and appendix tables C2 and C3 contain information on sources of financing. The preschool program (PNAC) obtains around a quarter of its funding from external donors (appendix table C2). The school feeding program (PAE) receives about 10% of its funding from municipal governments, and the rest from the central government, although the municipal share rose quite sharply in 1987 and 1988 (Appendix table C3). Appendix table C4 presents some information on costs of different interventions, which show the relatively high costs of the daycare feeding program (JUNJI) compared to the other two. Further recent information on Chile's nutrition programs can be obtained from Muchnik and Vial (1990), and Castaneda (1990).

The Philippines (Appendix B) has a strong Institute of Food and Nutrition, domestic support for nutrition interventions, as well as long-established external assistance. It is quite surprising that nutrition expenditures are therefore not higher as a share of GDP (the World Bank figures cited in table 11 suggest that the Philippines allots a smaller percentage of GDP to nutrition than the other four countries with available data). Appendix table B1 lists in detail the different nutrition

interventions, by Ministry, expenditure level, and number of beneficiaries, and World Bank estimates of total nutrition and health expenditures are reproduced in Appendix table B2. About 90% of the financing for nutrition interventions is from central government, and 10% from local government (Appendix table B4). The central government contribution is divided into receipts from taxes (80% of the total expenditures on nutrition), with the other 10% contributed by central government coming about equally from user fees and from foreign contributions (Appendix table B4). As regards local government contributions, about three quarters is from city governments, with the rest from provincial governments. (Municipal governments contribute a very small amount: Appendix table B3).

Appendix tables B5-7 present some comparative cost information for USAID-supported programs. There are differences by operating agency: CARE tends to report higher costs than CRS (Catholic Relief Services), however CARE tend to document costs better than most other NGO's. Of the 3 intervention types (school feeding, MCH and food for work), MCH programs are the cheapest. CARE reports the highest cost program is food for work, whereas CRS report the highest cost program is school feeding. Food for work and school feeding interventions cost 1.5-2 times as much as MCH programs. However once targeting is taken account of, they cost 4 to 6 times as much as MCH programs, per beneficiary with 2nd or 3rd degree malnutrition. Further information on programs in the Philippines is available in USAID (1982) and Aguillon (1986).

Data for Malawi are much more scanty. The majority of expenditures are financed externally. Domestic funding goes to the relatively new Food Security and Nutrition Institute, and as a contribution towards the WFP-financed feeding programs. Appendix table C1 presents information on WFP and UNICEF expenditures. There are few published sources describing nutrition interventions in Malawi, other than World Food Program project documents.

VI. Summary.

This paper has tried to draw together a large amount of disparate information on costs, cost-effectiveness and financing of nutrition interventions in developing countries. This final section summarizes what information was obtained, but does not draw specific conclusions.

Section I on methodology discussed the problems of the cost per death-averted measure, and raised the issue that this measure is not highly appropriate for nutrition interventions. Practical difficulties in measurement were also discussed, both problems in obtaining cost data, and the fact that impact data are so scarce.

Section II discussed how to standardize appropriately information on unit costs, and presented data on 52 feeding programs, 6 nutrition education programs (1 of which incorporated growth monitoring), 1 (hypothetical) breastfeeding promotion program, and 14 micronutrient fortification or supplementation programs. The costs of distributing 1000 calories per day per beneficiary per year was found to be about $75 for untargeted food rations (1 program), $64 for targeted food rations (median, 4 programs), $74 for MCH and school feeding programs (median, 52 programs), and $134 for highly targeted feeding programs (1 program) (all costs in 1988 US $). Costs of nutrition education ranged from $1-23 per beneficiary, and of breastfeeding promotion from $1-5 per beneficiary. Micronutrient intervention costs ranged from $0.04 to $4 per person-year of protection.

Section II also examined how program size, geographic location, operating agency, and type, affected unit costs of feeding programs. Program size does appear to matter, with the lowest costs being reported for medium-size programs. Location does not matter, except perhaps that programs in South Asia were slightly cheaper to run. There is no consistent difference between MCH and school-feeding programs, and between government-operated and NGO-operated programs. Externally financed programs might be somewhat more expensive, but this could not be fully investigated without better data.

Section III examined cost structure, and in particular the food/non-food breakdown for 81 feeding programs, 5 food subsidy programs, and 1 micronutrient intervention. Non-food costs account for about 17% of the total for targeted food rations (median, 4 programs), 25% for feeding programs (median, 81 programs), 20-34% in food for work programs (2 programs) and 29% for micronutrient supplementation programs (1 program). Non-food costs are lower in sub-Saharan Africa than in other regions, in medium-size programs, and possibly in NGO-operated programs. A summary table (table 8) highlighted some of the main findings of sections II and III, and compared them to the previous "received wisdom" on the topic.

Only limited information could be obtained on cost-effectiveness (section IV). A total of 8 estimates were available, 2 on cost per death-averted, 5 on cost per child removed from moderate or severe malnutrition (from which cost per death-averted could be extrapolated), and 1 on cost per case of blindness prevented (from which cost per death-averted was estimated). Data from the Narangwal project were also cited, on cost per death-averted for different age groups, for nutrition and medical interventions alone and combined. These figures are given in tables 9 and 10.

Section V on financing presented information on share of nutrition interventions in health budgets and GNP for 5 countries, and share in health budgets for 2 donor agencies. Information on expenditures on feeding programs was cited, for 16 Latin American countries. Information on the share of external financing was presented for 81 feeding programs. Three country studies were undertaken, providing somewhat fragmentary evidence on local versus central government funding. In general nutrition expenditures seem to account for about 10% of the health budget, both for individual developing countries, and for external donors. The share of nutrition expenditures in GDP had a median of 0.16% of GDP. About 90% of domestic nutrition finance seemed to come from central government, and 10% local government. External finance accounted for a larger share of nutrition expenditures in poorer countries.

More work is needed to improve data on costs, impacts and financing. An urgent priority is to obtain some project cost data for breastfeeding promotion (none is available). More work on the impact of project design could fruitfully be done using standardized project proposals or reports (in particular WFP proposals, USAID PVO Child Survival data and USAID Outreach grant data seem promising). Work could be done on project scale using service-delivery-unit level data (anghanwadi level data for the ICDS in India might be promising). More work could be done disaggregating components of costs (in more detail than the food/non-food breakdown used here). Again, WFP proposal documents might be a useful starting point. Many existing agencies could improve their record keeping, both with respect to standardized cost treatment, and with regard to recording estimates of impact. Better cost data need not involve much additional resources, but better impact data would. Nevertheless, better data are important so that important nutritional interventions are not de-emphasized in child survival initiatives relative to health interventions whose benefits are more easily quantified.

Table 1 Unit Costs of Education-Type Interventions

Country	Cost/Beneficiary	Comments	Source
	Nutrition Education		
Morocco	$1 - $3	monthly class: additional to MCH program	Hornick (1985)
Indonesia	$2	mass media component of MCH program	Hornick (1985)
Honduras	$2.50	mass media effort on ORT	Hornick (1985)
Philippines (Manoff)	$3.33	mass media efforts to add oil to weaning food	Hornick (1985)
Burkina Faso	$0.22	volunteers taught mothers to prepare weaning foods	Heimendinger, et al. (1981)
Dominican Republic	$23.17	combined with growth monitoring: community workers receive only token wages	USAID (1988)
	Breastfeeding Promotion		
Hypothetical	$1-$5	no program data	Phillips, Mills and Feachem (1987)

NOTE: costs are in current dollars.

Table 2 Unit Costs of Targeted Food Subsidies

Country	Energy Transfer Cal/Day	Cost '000 Cals/Person/ Day/Year in 1988 $US	Program Type	Food as % Total Cost	Operating Agency	Source
Brazil (PINS)	300	86.41	regionally targeted subsidy	83[a]	gov't (WB loan)	Pinstrup-Andersen (1988)
Colombia (coupons)	---	---	coupons targeted via MCH system	63[a]	gov't	"
Egypt	626	74.68	untargeted ration shops	--	gov't	"
Mexico	95[c] 248[d]	172.72	milk subsidy geog. targeted to children and PLF	74[a]	gov't	"
Philippines	272[c] 454[d]	36.01	geographically targeted oil and rice subsidy	86[a]	gov't	"
Sri Lanka	228	42.34	food stamps (income targeting)	--	gov't	"
Jamaica	---	---	food stamps (income targeting)	88[b]	gov't: (USAID assistance)	-

Notes
a: Source: Berg (1987).
b: Source: Margaret Grosch (personal communication): estimate only.
c: assuming all household members were intended beneficiaries.
d: assuming only certain household members were intended beneficiaries.

Table 3 Unit Costs of Feeding Programs (MCH and School Feeding)
Costs in US$ of 1988

Category	Range	Median	Mean	Number of Programs
All Programs	19.25 - 300	74.48	88.51	52
Asia	32.1 - 300	70.01	91.29*	21
North Africa	65.53 - 104.7	87.34	88.63	5
Sub-Saharan Africa	55.80 - 96.25	81.46	78.95	5
Latin America	19.25 - 272.54	67.18	87.96	21
School Feeding	19.25 - 208.59	81.46	88.74	11
MCH	26.75 - 272.54	73.84	85.64	37
Small (< 100,000)	26.75 - 272.54	96.48	121.92	7
Medium (1 - 500,000)	24.38 - 96.25	68.11	62.99	10
Large (≥ 500,000)	19.25 - 139.0	96.90	89.85	7
Gov't. Operated	19.25 - 272.54	75.11	91.73	37
NGO Operated	24.38 - 300	77.98	89.70	14

Source: Calculated from Appendix Table 1.

Notes:
* Falls to 80.32 for South Asia only.
Costs are in $ of 1988, cost per '000 calories/day/year

Table 4. Unit costs of micronutrient interventions.

	Country/Year	Cost per Person (US $)	Estimated Cost per Person (1987 US $)	Estimated Cost per Person per Year of Protection (US $)
Iodine				
Oil inj.[1]	Peru 1978	1.30	2.30	.46
Oil inj.[1]	Zaire 1977	0.35	0.67	.14
Oil inj.[1]	Indonesia 1986	1.00/inj	1.05	.21
Water fort.[1]	Italy 1986	0.04	0.04	.04
Salt[1]	India 1987	0.02-0.04	0.02-0.04	.04
Oil inj.[2]	Bangladesh 1983	0.70	0.76	0.25
Vitamin A				
Sugar fort.[1]	Guatemala 1976	0.07	0.14	.14
Capsule[1]	Haiti 1978	0.13-0.19	0.23-0.34	.46-.68
Capsule[1]	Indonesia/ Philippines 1975	0.10	0.21	.42
Capsule[2]	Bangladesh 1983	0.05	0.05	0.05
Iron				
Salt fort.[1]	India 1980	0.07	0.10	.10
Sugar fort.[1]	Guatemala 1980	0.07	0.10	.10
Sugar fort.[1]	1980	0.60	0.84	.84
Tablets[1]	1980	1.89-3.17	2.65-4.44	2.65-4.44

Sources:

1. Levin et al (1990)

2. Mills (1983)

Table 5 Administrative Costs of Selected NGO Feeding Programs

Country	Operating Agency	Non-food Cost\Beneficiary	Number of Beneficiaries
Benin	CRS	28.33	53,000
Ghana	ADRA	13.10	41,000
Sudan	ADRA	76.11	20,000
Average, 3 African Programs	---	31.24	---
Bolivia	ADRA	3.24	1,035,300
"	CRS	1.67	401,100
"	FHI	17.57	53,100
Haiti	ADRA	10.39	108,500
Average, 4 Latin American Programs	---	3.24	---

Source: Robert R. Nathan Assoc. Inc. (1987).
Programs were those which applied for a USAID Outreach grant in 1987.
Costs are in US $ of 1987

Table 6 Food Cost as Percent of Total Cost, Feeding Programs: Summary

Category	Range	Median	Mean	Number of Programs
All Programs	11 - 95	75	69.7	81
Asia	22 - 95	76	74.4	26
North Africa	(69 - 92)	(--)	(80.5)	2
Sub-Saharan Africa	80 - 90	84	84.4	5
Latin America	11 - 90	71	65.1	48
School Feeding	25 - 95	71	71.5	19
MCH	11 - 95	63	68.4	39
Small (< 100,000)	43 - 90	79.5	74.5	6
Medium (1 - 500,000)	58 - 90	85	82.0	8
Large (≥ 500,000)	31 - 92	69	70.7	7
Gov't. Operated	11 - 95	77	70.4	67
NGO Operated	54 - 90	74.5	77.3	14
[Targeted Food Subsidies	63 - 88	83	78.8	5]
[Micronutrient interventions	≈ 29			1]

Source: Calculated from Appendix Table 1 (excluding references from Mateus) and Appendix Table 2 (including references from Mateus).
Food costs include external transport where applicable.
Food costs bracketed in appendix are not included in the calculation.
Micronutrient data from iodine program in Bangladesh, Mills (1983).

Table 7 Costs of Some of Brazil's Nutrition Programs, 1978-80

Program Name	Description	Food As % Total Cost	Unit Cost (cruzeiro per kg.)	Unit Cost (cruzeiro per '000 cals)	Cost/Beneficiary/Year (cruzeiro)
PNS Model A	Food distribution	25			
			10 - 27	2.8 - 8.0	595*
PNS Model B	via health posts	73			
PCA	Distribution of special weaning foods	86	100	22-26	1,460*
PINS Model A	Food subsidy	91	37	10	
PINS Model B	experiment	66	33	9	
PINS Model C		67	83	23	29*
PINS Model D		80	22	6	
PINS Average		--	31	9	

Source: Musgrove (1989). Conversion to cruzeiro/kg by author using data in Musgrove (1989). The PNS program distributes food via health posts. Model A includes the cost of complementary health services, B excludes them. The PCA distributes food via community centres. The PINS operated a subsidy experiment, Model A had a 60% subsidy, B a 45% subsidy, but participants had to undertake regular monitoring to be eligible. Version C had a 45% subsidy, Version D a 30% subsidy.

*Note, these data are not standardized by size of ration. PCA provides a smaller quantity of food.

Table 8 Summary of costs by different types of food distribution programs

Program Type	From Mateus (1983) $/'000 Calories/ Beneficiary	From Mateus (1983) Non Food Costs As % Total	From present paper $/'000 Calories/ Day/Year/Beneficiary In 1988 US $	From present paper Non Food Costs As % Total
1. Untargeted food subsidies	500-600	(very low)	-	-
2. Untargeted food rations	50-120	20-30	75[a]	-
3. Targeted food rations (geographic/self targeting)	-	20-30	36-172[b]) 64	14-26[b]) 17
4. Food coupons				
- income targeting	60-180	2-5	42[c]	12-37[d]
- health status	60-120	2-5		
5. Feeding programs				
- MCH and school feeding	80-200	10-30	74[e]	25[f]
- most vulnerable group targeting	80-150	10-30	134[g]	71[g]
6. Food for work	-	-	-	20-34[h]

Notes and Sources:

a. Egypt: Table 2.
b. Brazil, Mexico, Philippines: Table 2.
c. Sri Lanka: Table 2.
d. Colombia and Jamaica: Table 2.
e. Median, 52 programs: Table 3.
f. Median, 81 programs: Table 6.
g. Tamil Nadu: Appendix Table 1: note non food costs fall to 56 per cent of health component is excluded: targeting is based on growth monitoring.
h. Bangladesh: Mills (1983). He argues higher figure is from program with better data, and therefore more accurate.

Table 9 Cost-effectiveness of Nutrition Interventions: Program Data

Intervention and Country	Cost per death averted	Cost per malnutrition averted[a]	Cost per blindness averted	Date	Source
Supplementary feeding					
Tamil Nadu	1482	33	--	1982	Ho (1985)
Targeted food subsidy					
Philippines	--	331	--	1982	Kennedy and Alderman (1987) calculated from Garcia and Pinstrup-Andersen (1987)
Micronutrient supplementation					
Bangladesh	1522	--	350	1983	Mills (1983)
Nutrition education					
Dominican Republic	--	493	--	1984-6	USAID (1988: excluding TA costs)
Indonesia NIPP	--	12	--	1983?	Hornik, 1985
Morocco	--	5	--	1980?	Hornik, 1985

[a]Cost per child removed from moderate or severe malnutrition.

Table 10. Cost-effectiveness of nutrition, health and combined interventions, Narangwal, India.

Age	Type of intervention		
	Nutrition only	Nutrition + Medical care	Medical care only
perinatal	570 (74)	710 (92)	1,010 (131)
infant (<1)	1,640 (213)	1,800 (233)	1,110 (144)
child (1-3)	23,540 (3,053)	31,030 (4,025)	7,690 (997)

Source: Taylor et al (1984). Costs are in Rupees of 1971, with US $ amounts in brackets. To convert to US $ of 1988, multiply by 2.45.

Table 11 Expenditures on Nutrition Programs, Selected Countries

Country	Year	As % Health Budget	Domestic Contrib. as % GDP	Total Exp. as % GDP	Source
Brazil	1986	10.8	0.18	-	Musgrove (1989) World Bank Docs.
India - state govt	1986-7	1.86[a]	0.16	-	Subbarao (1989)
- central govt		0.5 [a]			
Chile	1988	34.8	0.41	-	Author's calculations
Malawi[b]	1988	8.5	0.16	0.56	"
Philippines	1985	10.0	0.06	-	"
MCH and School Feeding Programs Only					
Brazil	1987	--	0.27	0.27	Mateus (1989)
Bolivia	1987	--	0.18	0.52	"
Chile	1987	--	0.53	0.57	"
Costa Rica	1987	--	0.29	0.29	"
Dominican Republic	1987	--	0.12	0.15	"
Ecuador	1987	--	0.19	0.22	"
Guatemala	1987	--	0.04	0.14	"
Haiti	1987	--	0.01	0.41	"
Honduras	1987	--	0.02	0.16	"
Jamaica	1987	--	0.10	0.30	"
Mexico	1987	--	0.24	0.44	"
Panama	1987	--	0.03	0.01	"
Paraguay	1987	--	0.06	0.09	"
Peru	1987	--	0.02	0.04	"
Uruguay	1987	--	0.17	0.17	"
Venezuela	1987	--	0.13	0.13	"

Notes

a % of government budget.

b domestic contribution to WFP project only

Table 12. Expenditures on nutrition interventions, UN agencies and USAID.

Agency	$ Spent on Direct Nutrition*	$ Spent on Health
UN Agencies: FY 1987		
FAO	450,000	-
UNICEF	31,660,000	165,000,000
WHO	6,800,000	138,000,000
UNDP	180,000	2,072,000
TOTAL UN AGENCIES	39,090,000	305,072,000
USAID FY 1988		
USAID Child Survival	26,000,000	170,000,000

Source: reproduced from Huffman and Steel, 1990.

*Direct nutrition is defined as projects having a direct impact on the nutrition status of the individual. Examples include direct feeding projects, growth monitoring and nutrition surveillance. Not included are health or food security.

Appendix Table 1 Unit Costs of Feeding Programs (School Feeding and MCH)

Country	Ration	Days	Cost/'000 Cals /yr (1988 $US)[a]	Number of Beneficiaries	Program Type	Food as % Total Cost[b]	% Cost Total Cost Externally Financed	Funding Agency	Operating Agency	Source
India-Poshak (extensive)	400	365	60.51	--	MCH	77	--	-	Gov't	Beaton and Ghassemi (1979)
Morocco	774	365	87.34	--	MCH	--	--	USAID	CRS	"
Sri Lanka	185	365	97.16	--	MCH	60	--	USAID	CARE	"
Tunisia	560	300	88.69	--	MCH	--	--	USAID	CRS?	"
India (SNP) (Andhra Pradesh)	300	300	70.01	--	MCH	75	--	-	Gov't	"
Warangyal	400	120	76-106	--	MCH	--	--	-	Gov't	Ghassemi (1989)
Philippines	400	90	232-369	--	?	--	--	USAID		"
Morocco	526	365	65.53	--	MCH	--	--	USAID	CRS	"
Sri Lanka	190	365	32.21	--	?	--	--	USAID	CARE?	"
India (ICDS)	330	365	66.67	--	MCH	--	--	WFP	Gov't	"
Tamil Nadu Midday Meals	418	200	67.02	--	SF	75	--	-	Gov't	Knudsen[c] (1981)
Tamil Nadu SNP Modified	347	300	52.57	--	MCH	95	--	-	"	"
Tamil Nadu SNP	--	--	69.55	--	MCH	95	--	-	"	"
Tamil Nadu balwadies	282	300	71.61	--	MCH	87	--	-	"	"
Tamil Nadu maternity to child health	--	--	60.49	--	MCH	94	--	--	"	"
Midday Meals Madras	418	--	132.47	--	SF	95	--	-	"	"
Tamil Nadu balwadies non-ANP	280	--	65.14	--	MCH	91	--	-	"	"
Tamil Nadu ANP	296	--	114.44	--	MCH	94	--	-	"	"
	397	--	73.84	--	MCH	80	--	-	"	"
Bolivia (4)	750	365	52.48	(3 small) (1 large)	MCH	81	--	WFP	Gov't & NGO	Mateus[d] (1989)
Dominican Republic (Complementary Feeding)	490	365	67.18	92,000	MCH	82	--	-	Gov't	"
Costa Rica (2 progs)	240	365	272.54	67,500	MCH	82	--	-	Gov't	"
Ecuador (2 progs)	498	365	89.16	550,000	MCH	82	--	-	Gov't	"
Guatemala - CARE	625	365	28.90	286,000	MCH	90	--	USAID	CARE	"
Guatemala - WFP	891	365	55.19	35,000	MCH	72	--	WFP	Gov't	"
Honduras (3progs)	1286	365	26.75	(each = 40,000)	MCH	90	--	-	Gov't / First Lady	"
Paraguay	684	365	96.48	33,000	MCH	83	--	-	Gov't	"

Country	Ration	Days	Cost/'000 Cals /yr (1988 $US)	Number of Beneficiaries	Program Type	Food as % Total Cost	% Cost Total Cost Externally Financed	Funding Agency	Operating Agency	Source
Bolivia (4 progs)	325	165	53.53	(2 large) (2 small)	SF	82	--	USAID	NGO	Mateus[d](1989)
Ecuador (collaccion)	365	165	61.10	200,000	SF	84	--	-	Gov't	"
Guatemala	456	165	19.25	1,093,000	SF	49	--	-	Gov't	"
Honduras (2 progs)	180	165	24.38	(300,000) (294,393)	SF	71	--	USAID	CARE/EEC	"
Paraguay	324	165	208.59	76,493	SF	25	--	-	Gov't	"
El Salvador 2317	1300	182.5	75.11	164,250	MCH	58	57	WFP	Gov't	WFP[e] documents
Gambia 625	858	196	81.46	376,202	SF	90	93	WFP	Gov't	"
Morocco 2288 Exp II	900	140	96.90	1,024,350	SF	69	56	WFP	Gov't	"
Somalia 2349 Exp I	734	335	96.25	270,000	refugee, MCH	84	81	WFP	Gov't	"
Exp II	719	280	86.21	496,000	and 14% SF	30	83	WFP	Gov't	"
Tunisia 3408	843	120	104.70	775,400	SF	92	66	WFP	Gov't	"
Nepal 3718	622	293	56.50	377,650	MCH) 50% SF) 50%	86	93	WFP	Gov't	"
Brazil 3242	1265	313	44.79	160,000	MCH	81	14	WFP	Gov't	"
Malawi Exp II	668	365?	75.20	258,112	MCH (NRC+hospital)	87	74	WFP	Gov't	"
Exp III	733	365?	55.80	506,495	"	81	69	WFP	Gov't	"
India SNP/ICDS 2206 Exp IV	386	270	115.18	2,120,000	MCH	67	67	WFP	Gov't	"
Paraguay 2376 Exp II	307	224	139.0	736,200	MCH) 66% SF) 33%	65	63	WFP	Gov't	"
Bolivia 2795	1175	200	126.7	70,500	SF	77	73	WFP	Gov't	"
Colombia	305	365	130.93	--	MCH TH	54	49	USAID	CARE	Anderson (1979)
Costa Rica	959	200	159.06	--	MCH SUPE	74	94	-	CARE	"
Dominican Republic	337	365	63.92	--	MCH TH	77	29	-	CARE	"
India	340	200	68.62	--	MCH SUPE	75	39	-	CARE	"
Pakistan	298	365	127.29	--	MCH TH	70	6	-	CARE	"
Brazil PROAPE	500	365(?)	112.98	--	MCH	44	--	WB	Gov't	Pinstrup-Anderson (1988)
India Tamil Nadu	300	365(?)	134.10	--	MCH	29	--	WB	Gov't	"
Indonesia NIPP	--	--	--	--	MCH	51	--	WB	Gov't	"

Notes

a) Unit costs per recipient per '000 calories daily for a year were calculated using information on costs per recipient, ration size and number of feeding days in original source. All costs were transferred to US $ of 1988 using the producer price index of consumer foods from Economic Report of the President: transmitted to Congress February 1989, Office, 1989. Washington: US Government Printing Office, 1989.

b) Food costs include external transport costs where applicable.

c) Exchange rate from IMF International Financial Statistics was used to convert from Rupees to US $ of 1976-7.

d) For data in Mateus (1989) administrative costs were only available for several programs combined within each country. It was assumed that administrative costs were approximately the same for all MCH-type programs within one country, and for all school feeding programs within one country.

e) Data on WFP programs were calculated by this author from WFP documents. Non-recurrent costs in WFP budgets were excluded.

SF School feeding.

Appendix Table 2: Food as % of Total Costs of Feeding Programs

Country	Operating Agency	Number of Beneficiaries	Program Type	Food As % Total Cost	Source
India Special Nutrition Program	Gov't.	-	MCH	77	Sahn (1980)
India - Poshak					
- exploratory phase	"	-	"	(42)	"
- extensive primary health centre	"	-	"	79	"
- extensive secondary health centre	"	-	"	(76)	"
- intensive take-home	"	-	"	(42)	"
- intensive supervised	"	-	"	(35)	"
India	CRS	-	"	89	"
India: Indo-Dutch project for child	n.a.	-	"	79	"
India ICDs					
- rural	Gov't.	-	"	66	"
- tribal	"	-	"	69	"
India: Child care nutrition centre	n.a.	-	"	56	"
India: Kasa MCHN project	n.a.	-	"	22	"
Brazil					
- MCHN	Gov't.	--	MCH	51	Mateus (1989)
- PCA	"	--	"	51	"
- PSA	"	--	"	51	"
Bolivia	Several PVO's	--	"	81	"
Chile	Gov't.	--	"	82	"

Costa Rica	"	67,500	"	82	"
Dominican Republic	"	--	"	82	"
Ecuador	"	550,000	"	90	"
Guatemala	CARE	286,000	"	90	"
	WFP	35,000	"	72	"
Haiti	CARE	--	"	55	"
Honduras	Gov't.	3 Programs each about 40,000	"	90	"
Jamaica	Gov't.?	--	"	78	"
Mexico					
- DIF	Gov't.	--	MCH	62	"
- IMSS	"	--	"	63	"
- SSA	"	--	"	63	"
- Liconsa	"	--	"	76	"
Panama	CARE	--	"	71	"
- MCHN	Gov't.	--	"	43	"
Paraguay	Gov't.	33,000	"	83	"
Uruguay					
- MCHN	Gov't.	21,000	"	11	"
- MSP	"	--	"	31	"
- PNCA	"	592,000	"	50	"
- AIPP	"	--	"	50	"
- ACAM	"	--	"	50	"
Venezuela	Gov't.	--	"	45	"

Brazil	Gov't.	--	School Feeding	51	"
Bolivia	Several NGO's	--	"	82	"
Chile	Gov't.	--	"	78	"
Costa Rica	"	--	"	74	"
Dominican Republic	"	--	school feeding	81	"
Ecuador	"	2 Programs:			
		200,000	"	84	"
		128,000	"	84	"
Guatemala	"	1,093,000	"	49	"
Honduras	CARE	2 Programs:			
	+ ECC	300,000	"	71	"
		294,000	"	71	"
Jamaica	Gov't.	--	"	78	"
Mexico					
- INI	Gov't.	--	"	55	"
- PIF	"	--	"	61	"
Panama	"	--	"	71	"
Paraguay	"	76,000	"	25	"
Uruguay - PNCA	"	126,000	"	(unlikely)	"
Venezuela	"	--	"	82	"

Appendix Table 3: Per Cent of Program Cost Financed Externally

Country	Program Type	% Cost Financed Externally
Brazil	MCH	0
	SF	0
Bolivia	MCH	88
	SF	18
Chile	MCH	6
	SF	5
Costa Rica	MCH	0
	SF	0
Dominican Republic	MCH	20
	SF	20
Ecuador	MCH	69
	SF	88
Guatemala	MCH	69
	SF	49
Haiti	MCH	98
Honduras	MCH	90
	SF	71
Jamaica	MCH	50
	SF	88
Mexico	--	61
Panama	MCH	64
	SF	70
Paraguay	MCH	71
	SF	25
Peru	MCH	63
Uruguay	MCH + SF	0
Venezuela	MCH + SF	0

Source: Mateus (1989).

Appendix A: Summary of main interventions in Chile.

Appendix tables A1 to A4 provide some information on costs and financing, and a brief description of the main programs follows.

1. National Supplementary Feeding Program (PNAC)

-Started in 1937, this is the oldest program, and has the largest number of beneficiaries. Around 1.2m children under 6 are covered (80% of infants under one year and 70% of 2-5 year olds). Pregnant and lactating mothers covered also.

- The supplement is distributed via public health system and varies by age and nutritional/health status. Rations are provided on a monthly basis. E.g. 0-5 month olds receive 2kg of 26% milk per month in the basic program.

- To promote targetting of poor income groups, the service was linked formally to primary health service in 1980. This has kept down administration costs. Food costs represented 98% of budget in 1989.

- Finances come from the Ministry of Health, Central Government, and Municipalities. The latter must finance transport and distribution of food via the primary health care facilities. Project costs are linked closely with food prices and supply. Costs per beneficiary vary significantly between groups.

- Substantial leakage to high income groups occur through the basic program. Further targeting will be required to avoid this.

2. Corporation for Infant Nutrition (CONIN)

Established by INTA (National Nutrition Institute) in 1975 to provide inpatient care for infants suffering severe malnutrition. 80% of funding comes from the central government, 20% from private sources via INTA. Infants are identified through the National Health Service nutrition surveillance system. In 1985 cost per beneficiary was approximately US$600.

3. Colocacion Familiar para Ninos Desnutridos (COFADE)

Children in Metro Santiago suffering from 2nd and 3rd degree malnutrition are placed with a foster family. The family is given US$46 per month(1987) to help care for the child. Funds come from the municipality (of Santiago) involved (40%) and from the Health Service Area (60%) (Min. of Health Budget). 150 children served per year- very low cost program, especially when compared to CONIN.

4. Junta Nacional de Jardines Infantiles (JUNJI)

- Formed as an autonomous body in 1970 to provide a comprehensive daycare program for pre-school children in urban areas. A complementary feeding program is an integral part of the project

- The day care facility operates M-F 8:30 a.m.- 5:30 p.m. all year except February, and nursery care is provided for 0-2 yr olds, mid level care for 2-4 yr olds, transitional level for 4-5 yr olds. Language, psychomotor and social skills are developed.

- This program is the most expensive on a cost/beneficiary basis:

	1986	1989
personnel	54%	60.35%
food	35%	31.9%
other	10.9%	7.8%

Cost/beneficiary is around US$418 due to high salaries of university trained pre-school teachers.

- Total coverage is below need. 45% of children enrolled in JUNJI were in the greater Santiago metropolitan area. Poorer regions and rural areas receive much less help. In 1987, 59% of pre-school subsidies went to families in the two lowest income quintiles (22% went to the two upper quintiles)

5. Centros de Alimentacion y Estimulo (CADEL)

In response to the high cost and inadequate coverage of JUNJI, Centros de Alimentacion y Estimulo were established in 1987 in urban neighborhoods.

- Community based approach with volunteers from the neighborhood. Services are offered half day only. Lunches and snacks provide about 750 cal. per day (50% of average dietary requirement). CADEL centres average about 30 children each, there are about 360 of them in most urban and semi-urban areas. Food costs represent 75% of CADEL expenditures.

6. Other Preschool Programs

-Private non-profit agencies such as CARITAS and FNACO operate day care programs. FNACO assists about 45,000 children per year, and CARITAS and JJII (Fundacion Jardines Infantiles) about 37,000 children per year.

7. Programa de Alimentacion Escolar (PAE)

- Provides free lunches and a breakfast or snack to poor children between the ages of 6 and 14 attending public and private primary schools, and all

students in rural residential primary and secondary schools.

- Means tested system used to target beneficiaries, based on family income, mother's education, teacher's opinion, nutritional status, etc.

- 189 days coverage, and additional summer coverage for low income children (Jan/Feb). About 700 calories and 20g protein (33% ofRDA of protein/calories) are provided each day. Daily participation rates fluctuate depending on enrollment and socioeconomic level of region. 57% of students enrolled in eligible rural schools are served, and 28% in urban eligible schools:

	1988	1985
Beneficiaries	610,714 (534,465 exc JUNJI)	616,526

- Cost per beneficiary (per year) is around US$19 for breakfast and US$51 for lunch (US$70 for a full ration). 85% of budget is allocated to food costs. Municipalities usually fund just under 10% of the program.

Sources: Muchnik and Vial (1990), World Bank unpublished documents, Castaneda (1990).

Appendix table A1. Chile: annual expenditures on nutrition intervention programs. (million 1987 US $)

YEAR	PNAC	PAE	JUNJI (CADEL included after 1987)	TOTAL
1974	35.4	-	6.4	-
1975	36.2	-	5.1	-
1976	36.4	-	6.5	-
1977	43.1		10.8	-
1978	36.9	35.8	19.2	91.9
1979	40.1	37.3	19.7	97.1
1980	29.3	38.7	17.1	85.1
1981	36.3	44.7	16.8	97.3
1982	37.9	43.0	17.9	98.8
1983	29.7	43.8	16.9	90.4
1984	47.9	46.7	16.0	110.6
1985	42.1	47.6	17.0	106.7
1986	35.9	43.1	18.2	97.2
1987	44.0	34.4	17.2	95.6
1988	42.7	31.5	19.8	94.0

Source: Muchnik and Vial (1990)

Appendix table A2. Chile: Sources of central government expenditures on PNAC (million 1986 US $)

YEAR	BUDGET FROM MINISTRY OF HEALTH	FOREIGN DONATIONS	TOTAL BUDGET
1978	35.0	n.a.	n.a.
1979	38.1	n.a.	n.a.
1980	27.8	n.a.	n.a.
1981	34.5	n.a.	n.a.
1982	35.9	n.a.	n.a.
1983	28.2	n.a.	n.a.
1984	35.1	10.3	45.4
1985	29.7	10.3	40.0
1986	26.1	9.0	35.1
1987	38.5	3.2	41.7
1988	31.1	9.8	40.9

- not including municipal expenditures
- 1986 period average exchange rate used - Ch $193.016:US $1.00
- Source: World Bank unpublished documents

Appendix table A3. Chile: Financing of school feeding program (PAE).
(1988 US$m)

Year	Central Govt	Municipal Govt
1981	47.3	0.5
1982	41.4	4.6
1983	43.7	5.7
1984	45.3	5.0
1985	47.7	4.1
1986	44.0	5.6
1987	34.7	7.5
1988	34.9	8.6

Based on CH$245.048: US$1.00
Source: World Bank unpublished documents

Appendix table C4. Cost per beneficiary and per calorie of major interventions.

PROGRAM	Total Annual Cost (US$M)	K Cal. Delivered (Million)	# of Benef. ('000)	Cost/Ben per year (US$)	Cost/Kcal (US cents)	Cal/Benef per day[1]
PNAC	39.7	135,457	1,042.0	38.1	0.0293	130.2
PAE	35.0	80,244	557.3	62.8	0.0436	394.0
JUNJI	16.0	10,571	55.9	300.0	0.1510	518.0

[1] Average calories received per beneficiary per day, assuming the total amount of calories provided were distributed in 365 days.
Source: Muchnik and Vial (1990).

Appendix B

Summary of Main Nutrition Interventions in the Philippines

Four major categories of nutrition interventions exist, classified by the National Nutrition Council (NNC) as follows:

1. Food Assistance (5.158)

2. Nutrition/Nutrition Related Health Services (3.920)

3. Incremental Food Production (5.462)

4. Nutrition Communication (0.835)

(Figures in brackets give numbers of beneficiaries in first 3 quarters of 1989 in millions.)

The NNC was established in 1974 by the government of Philippines in recognition of nutrition as a national priority. USAID PL480 title II assistance has played a major role in the country. Since 1960 over $300m in food has been shipped to Philippines. In 1989, 52,435 metric tonnes of food were shipped to Philippines ($13.825m) through two agencies, CARE and CRS (Catholic Relief), mostly for MCH and School feeding programs.

Appendix table D1 summarizes the main interventions within each of the 4 groups above, and a brief description follows.

1. FOOD ASSISTANCE PROGRAM

- Short term rehabilitation approach for malnourished and at-risk groups collaborative effort of government and NGO's.

2. NUTRITION/NUTRITION RELATED HEALTH SERVICES

- Rehabilitation of moderate/severe malnutrition cases, and control of nutrition-related communicable diseases
- Nutrition and related health services for schools
- Food and micronutrient supply to target groups
- Information dissemination and education

4. INCREMENTAL FOOD PRODUCTION

- To increase awareness among government and NGO's on nutrition issues and importance
- Classes on nutrition, breastfeeding, targeting parents
- Dissemination through mass media: "Nutrition School-on-the-Air"

Foreign Assistance

In 1989 PL480 supplied 521,435 metric tonnes of food at a cost of $13.825 million. These commodities went through four types of intervention, run by CRS and CARE. Appendix tables B5-B7 present information on costs and targeting of these programs (from USAID, 1982)

Sources: World Bank unpublished documents, USAID (1982), Aguillon (1986).

Appendix Table B1

Philippines: Summary of Main Nutrition Intervention

Project	Description	Ministry	Target Pop.	Funds
I **FOOD ASSISTANCE PROGRAM**				
1. Nutrition Support	Provide Insumix and teach proper preparation of indigenous weaning foods	DA	34,064	n.a.
2. Milk Program	200,000 litres of milk distributed	DA	n.a.	n.a.
3. Targeted Food Assistance Program	Aims to reduce prevalence of severe and moderate malnutrition in pre-schoolers; provides 1/3 - 1/4 of RDA of calories and protein	MOH	1,119,726	18,394,833 +3,800,893 (Admin Cost) 22,195,726
4. Akbayan Sa Kalvsugan (ASK) (WFP assisted)	same as (3)	MOH	50,000	350,000 (not including Admin. Cost)
5. Targeted Food Assistance (WFP, PHI 2607)	same as (3)	MSWD	100,000	2,400,000
6. Supplementary Feeding (CRS Supported)	same as (3)	MSWD	897,090	20,913,237 (DSWD) 62,253,416 (CRS)
7. Disaster/Emergency Assistance	Ready to eat food for disaster victims and stranded individuals; food for work to assist refugees	MSWD	2,114,944	23,881,346

Project	Description	Ministry	Target	Funds
8. Alternative School Program Nutrition	To develop local capabilities to undertake self-sustaining school nutrition programs; Emphasis on supplementary feeding supported by income generating feeding activities by school and families	DECS	32,000	1,000,000
9. DECS-PL480 Food Assistance Program	Improve status of underweight public elementary school children	DECS	1,200,000	19,005,000 pesos
10. Applied Nutrition Program (ANP)	Promote increased production of nutritionally valuable food, and using this to feed schoolchildren	n.a.	18,000	940,000
II NUTRITION/NUTRITION RELATED HEALTH SERVICES				
1. Vitamin A Supplementation (MOH)	200,000 IU of Vitamin A every 6 months to underweight pre-schoolers and nursing mothers	MOH	3,454,939	2,626,407
2. Iron Supplementation		MOH	1,386,919	2,113,990
3. Iodine Deficiency Disorder Control Program (MOH)	Curative: iodine oil & tablets Preventive: iodized salt Promotive	MOH	479,826	2,824,977
4. Nutriward (MOH)	Treatment and rehabilitation for underweight/undernourished preschoolers	MOH	66,577	n.a.
5. Control of Diarrhea Diseases (MOH)	To reduce mortality from diarrhea among infants and young children	MOH	250,755	51,998,829 (WHO,UNICEF,USAID) 1,425,000 (GOP)

Project	Description	Ministry	Target	Funds
III INCREMENTAL FOOD PRODUCTION				
1. Promotion of Improved Crop Technology		DA	2,129,797	n.a.
2. Distribution of Seed and Planting Inputs		DA	337,059	n.a.
3. Establishment of Home Gardens (Training)		DA	160,955	n.a.
4. Annual Health & Disease Management		DA	71,393	n.a.
5. Annual Dispersal (improved breeds to enhance income)		DA	5,505	n.a.
6. Fresh Water Agriculture Development		DA	8,891	n.a.
7. Fish Processing Technique Development		DA	14,946	n.a.
8. Promotion of Business Activity to Develop Entrepreneurial Skills		DA	18,257	n.a.
9. Self-Employment Assistance Program	Parents of supplementary feeding program enrollees taught self-employment skills and food production to augment income	DSWD	88,189	27,880,000 pesos
10. Communal Gardens	Parents of underweight children taught to undertake communal gardens	n.a.	88,104	27,886,307
11. Alay Tanim at Pangka-buhayan (ATP)	Practical educational exp. to improve economic productivity, health & nutrition status	ATP	100 seed centres 2252 supervisors/ teachers provided	1,000,000

Project	Description	Ministry	Target	Funds
IV NUTRITION COMMUNICATIONS				
1. Promotion of Improved Farm/Home Management Practices, incl. Nutrition		DA	469,331	
2. Information Dissemination through print & media	11,246 radio hours 392 tv hours 429,377 pc's distributed	DA	303,576	
3. Nutrition Classes to provide information on adequate food intake and child rearing		DSWD	540,000 329,743 138,000 1,007,743	Mothers of underweight children, pregnant/ lactating women, out of

Source: National Nutrition Council (1990)

Notes:
- MOH Ministry of Health
- DA Department of Agriculture
- DECS Department of Education, Culture and Sports
- DSWD Department of Social Welfare and Development

Appendix Table B2

Philippines: Population, Health and Nutrition Share of Government Spending (%)

	1981	1982
Health	4.3	4.9
Population	.3	.4
Nutrition	.2	.2
Total	4.8	5.5

Source: World Bank unpublished documents

Appendix Table B3

Philippines: Local Government Expenditure on Population, Health and Nutrition

	Provincial	City	Municipal	Total	% of Total Local Government Expenditure
1981	47.6 (6.5)	209.1 (28.4)	2.3 (.31)	259.1 (35.2)	5.5%
1982	48.4 (6.6)	217.7 (29.5)	2.4 (.33)	268.5 (36.4)	4.7%

Source: World Bank unpublished documents
US$1 = P7.37, (1978)
Figures are in 1978 pesos (bracketed figures are US$ of 1978)

Appendix Table B4

Philippines: Government Health Funds By Source

	1981		1982		1983		1984		1985	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
National Government	2,453.9 (310.6)	89.7	2,097.8 (246.8)	90.6	3,573.8 (324.9)	91.2	3,174.4 (190.1)	88.3	3,275.4 (176.1)	86.7
Taxes	2,200.7 (278.6)	80.4	2,689.2 (316.4)	81.3	3,211.0 (291.9)	81.9	2,859.9 (171.3)	79.5	2,848.6 (153.2)	75.4
Operating Income	185.1 (23.4)	6.8	173.7 (20.4)	5.2	190.4 (17.3)	4.9	149.3 (8.9)	4.2	160.0 (8.6)	4.2
Foreign Loans & Grants	68.1 (8.6)	2.5	134.9 (15.9)	4.1	172.4 (15.7)	4.4	165.2 (9.9)	4.6	266.9 (14.3)	7.1
Local Government	282.4 (35.7)	10.3	311.6 (36.7)	9.4	347.0 (31.5)	8.8	422.0 (25.3)	11.7	503.7 (27.1)	13.3
Total	2,736.3 (346.4)	100%	3,309.4 (389.3)	100%	3,920.8 (356.4)	100%	3,596.4 (215.4)	100%	3,779.1 (203.2)	100%

Source: World Bank unpublished document
Exchange rate conversions (per US$): 1981 - 7.9; 1982 - 8.5; 1983 - 11.0; 1984 - 16.7; 1985 - 18.6
Figures are millions of current pesos (US$ in brackets)

Appendix table B5. Average Cost to supply 1000 Calories of Food Value
(Based on Total Program Cost)
(U.S. Cents per 1000 Calories)

FY	MCH		Day Care	School Feeding		FFW	
	CRS	CARE	CRS	CRS	CARE	CRS	CARE
1979	12	21	N.A.	17	29	16	32
1980	14	20	19	28	29	18	31
1981	22	24	N.A.	44	34	26	37

Source: USAID (1982)

Appendix table B6.

Percent of Sample with 2nd and 3rd Degree Malnutrition

MCH	
CRS	77.0
CARE	95.0
DAY CARE (CRS)	
MSSD Sample	37.5
Urban	13.6
Rural	57.0
SCHOOL FEEDING	
CRS	23.0
CARE	35.2

Appendix table B7

Implicit Average Cost to Supply 1000 Calories of Food
to Targeted Population (2nd and 3rd Degree Malnourished)
(U.S. Cents per 1000 Calories)

FY	MCH		Day Care			School Feeding	
	CRS	CARE	Average	Urban	Rural	CRS	CARE
1979	15.6	22.1	N.A.	N.A.	N.A.	73.9	82.4
1980	18.2	21.1	150.7	13.9	33.3	121.7	82.4
1981	28.6	25.3	N.A.	N.A.	N.A.	191.3	96.6

Source: USAID (1982)

Appendix C Summary of Main Interventions in Malawi

Appendix table E1 provides information on expenditures on nutrition by UNICEF and the World Food Program, and a brief text discussion follows.

- Malnutrition is a serious problem: approximately half the children under age 5 are stunted due to chronic malnutrition (i.e. below -2 SD of height for age) among 2 year olds, 2/3 are already stunted.

- The major cause is household food insecurity. Also, the staple food in the country has very low nutritional value as usually prepared for children.

    - Estate-oriented development strategy has been the main course of food insecurity, especially for small holders. Success of estate agriculture did not spill over to other producers or sectors.

    - The principal staple is porridge made from steamed maize flour. The nutritional value depends on consistency of the porridge; small children are given very thin recipes, hence nutritional value is very low.

- Extent of poverty in rural areas of Malawi is another cause of the problem.

    - A recent WB report cited that 55% of households cultivated less than 1 hectare of land. 26% cultivated less than .5 hectare.

- Through substantial donor and other pressure the government of Malawi has recently started to recognize the need and importance of a coherent nutrition program. The Food Security and Nutrition Unit (FSNU) was established in 1986 in response to this pressure. Its objective is to reach food security and nutrition goals in the most effective manner.

- The FSNU is understaffed and underfunded, although it has received substantial help from HIID and Cornell/UNICEF. The latter are more involved in food security and nutrition issues.

- As of early 1989, the FSNU has only been able to provide a policy paper. This is still under discussion.

- As a result, the nutrition problem in Malawi is being tackled by foreign NGO's, WFP and UNICEF.

    - UNICEF has an area based project, and also assists the FSNU in preparing and evaluating data, growth monitoring, education, and a small micronutrient supplementation project.

    - The major intervention is the supplementary feeding program of WFP (project 525).

    - WFP feeding program is integrated with most activities linked to nutrition education, growth monitoring and preventive health care (immunization).

- Health Centre based feeding program

- food supplement gives incentive for attendance at nutrition clinics

- but only about 60% of targeted children and 70% of targeted mothers attend, due to distance, work, etc.

- Ministry of health will begin to deliver services in communities also, not just at centres. This community based supplementation feeding program is a new part of expansion 3

Source: World Bank unpublished documents and World Food Program project documents.

Appendix table C1. UNICEF and WFP expenditures on nutrition in Malawi

Activity	Comments	US Dollar 1989	US Dollar Estimated 1990
UNICEF			
Growth Monitoring	Training	37,000	22,000
	Scales	18,000	14,300
Micro-nutrients	Iron Supplements	8,400	8,400
	Retinol	18,174	18,174
	Iodine	22,300	22,300
National Planning: Nutritional Surveillance	Includes Tech. Assist from Cornell and Wshops, surveys equipment	225,000	345,000
Area Base Project: (Water, sanitation health & nutrition education, GM agricultural inputs)	Nichisi district (pop'n = 12,000)	100,000	80,000
	Nkhata Bay District	------	------
	Mangochi District	------	------
	Ekwendeni Mission Hospital	34,000	------
Nutrition Education	Printing 50,000 copies of Nutrition Facts Book	------	64,000
Cassava Cuttings to drought affected area	Emergency Response	145,000	------
Total		607,874	734,174
WFP			
feeding programs	MCH, NRC's, hospitals and community program: local contribution 31%	7,000,000	7,000,000

APPENDIX D: List of contacts (excluding country study).

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